

3 *Threats to Wildlife Diversity in California* ~~~

The regional chapters describe the problems and threats that may adversely affect wildlife and their habitats. These threats are termed “stressors.” In each region of the state, there are multiple stressors to wildlife and habitats, operating alone and in combination. A number of these stressors are common to the entire state or to several different regions. The scope and effects of the most widespread stressors are briefly described below. More in-depth discussion of these stressors and their roles in each region can be found in the regional chapters.

Growth and development, water management conflicts, **invasive** species, and climate change each have major consequences for species, **ecosystems**, and **habitats** in every region of the state.

Growth and development

Statewide, California’s population grew by 49 percent between 1970 and 1990 and again by nearly 14 percent—adding over 4 million residents—between 1990 and 2000 (CDOF 2005). Increasing needs for housing, services, transportation, and other infrastructure place ever-greater demands on the state’s land, water, and other natural resources. Without conservation planning, growth and development can eliminate important habitats and fragment and decrease the quality of remaining natural areas. With the exception the Modoc Plateau, development represents a substantial stressor for species and habitats across the state.

In the South Coast, for example, nearly 40 percent of the region’s land has been converted to urban and suburban use (CDF 2002). Some habitat types have been reduced to a small fraction of their historical extent; **vernal pool** habitats have been reduced to less than 5 percent of their historical extent

(USFWS 1998g) and coastal sage scrub to about 18 percent (Pollak 2001a). Populations of species that depend upon these habitats have declined significantly.

In other parts of the state, growth and development threats have increased tremendously in recent decades. The Sierra Nevada, for instance, underwent population growth of 130 percent between 1970 and 1990, and future growth in the region is expected to continue to exceed the state average (SNEP 1996, Duane 1998). Most of this growth is low-density, single-home and commercial development that lacks the benefit of regional conservation planning. The Central Valley and the **Inland Empire** also continue to develop at a rapid pace.

Water management conflicts

Across all regions of the state, limited water resources are managed to meet water and power supply needs and to accommodate residential and agricultural land use. Water management activities include the operation of dams and diversions, development and operation of irrigation canal systems, extraction of groundwater, and construction of flood-control projects like levees and channelization. These activities can reduce the amount of water available for fish and wildlife, obstruct fish passage, and result in numerous other habitat alterations. In all regions of the state, **aquatic** and **riparian** habitats support rich biological communities, including many **special status species**, and degradation of these habitats represents a serious threat to the state's biological heritage.

The highly controlled water resources of the Central Valley and Bay-Delta region exemplify many of these water management issues. Dams are located on all but one of the major rivers flowing into the Central Valley, more than 2,600 miles of rivers are constrained by levees or bank protection, and up to 70 percent of the region's freshwater flows are diverted (DWR 2005b, Steere and Schaefer 2001). As a result of these alterations, natural riverine habitat is lost, and fish migration routes are disrupted. In many regions of the state, diversions and groundwater pumping deplete river basins to the point where river reaches regularly dry up or are diminished to such low flows that native species cannot survive; this has occurred in such rivers as the Carmel River on the Central Coast (CDFG 1996), the Colorado River in the Colorado Desert (Pitt 2001), the Mojave River in the Mojave Desert (CDFG 2004e), and the Scott and Shasta rivers in the North Coast–Klamath Region (CDFG 2004g).

Invasive species

Since the arrival of the first European settlers in California, non-native species have been introduced both unintentionally and purposefully to the state. At present, more than 1,000 introduced plant species (Barbour et al. 1993) and more than 110 non-native fish and wildlife species inhabit California (Grenfell et al. 2003, Moyle 2002). Among these non-native species, those that disrupt or alter native ecological communities and have negative consequences for native species and habitats are considered to be invasive.

In many habitats, invasive plants outcompete native species for light, water, and soil. These plants may also offer inferior habitat and nutritional values for native animal species and sometimes alter ecosystem processes, such as natural **fire regimes**. Invasive animals outcompete, prey upon, or disturb the habitat of native wildlife and may spread diseases.

The invasive riparian plants arundo and tamarisk, which are pervasive throughout the central and southern portions of the state, illustrate the scale of habitat disruption that can be caused by invasive vegetation. Both species displace native riparian vegetation and provide inferior habitat for wildlife. Other highly aggressive plants include starthistle and medusahead, both of which invade grasslands and scrub habitats across the state. Control of these aggressive plant species adds a substantial work burden to the management of natural lands.

Invasive species are also a major concern in the Marine Region, where discharged ballast water and other sources can introduce marine organisms carried from a ship's home port. San Francisco Bay ranks as one of the most-invaded bodies of water in the world, and estimates are that a new species unintentionally becomes established in San Francisco Bay every 14 weeks (SFEI 2004). Among the invasive marine species introduced to California's coastal waters are the Asian clam and European green crab, which have caused declines in phytoplankton and Dungeness crab populations, respectively (Grosholz 2002, Grosholz et al. 2000).

Climate change

Climate change will affect ecological communities and wildlife species throughout California. Current climate models predict overall temperature increases of between 4 degrees and 10.5 degrees Fahrenheit by the end of the century, accompanied by hotter, drier summers and warmer, wetter winters (Hayhoe et al. 2004, Schneider and Kuntz-Duriseti 2002, Turman 2002).

Rising temperatures and altered precipitation patterns will result in changes in plant communities and reduced habitat suitability for some wildlife species. Some communities and species may shift to higher elevations or latitudes, but this will become ever more challenging as remaining natural areas shrink and the gaps between habitats grow. Throughout the state, drier summers may also increase fire frequency and intensity. Climate change effects will be especially disruptive in the Sierra Nevada and Cascades and Central Valley and Bay-Delta regions.

In the Sierra Nevada, warmer temperatures will reduce the annual snowpack and result in earlier snowmelt. Spring and summer streamflows are projected to decline by as much as 25 percent by 2050 and 55 percent by the end of the century (duVair 2003). With warmer temperatures, alpine and subalpine communities may also be greatly reduced.

In the Bay-Delta region, soil erosion has caused farmlands to subside to elevations below sea level. These areas are protected by levees, but rising sea levels could overstress levees and water pumping systems, resulting in flooding and failure of water-conveyance system (Mount and Twiss 2005).

Other widespread stressors

A number of other stressors also recur in multiple regions. Excessive livestock grazing, either in sensitive habitats or grazing of too many animals or for too long a grazing period, significantly affects wildlife habitats in the Mojave Desert, Central Coast, North Coast–Klamath, Modoc Plateau, and Sierra Nevada and Cascades regions. Forest management conflicts are major stressors in the North Coast–Klamath, Modoc Plateau, and Sierra Nevada and Cascades regions. Altered fire regimes were identified as major stressors in the South Coast, North Coast–Klamath, Modoc Plateau, and Sierra Nevada and Cascades regions. Pollution and urban or agricultural runoff were identified as major stressors in the South Coast, Central Coast, Central Valley and Bay-Delta, and Marine regions. Recreational pressures and human disturbance are issues in the Mojave Desert, Colorado Desert, South Coast, Central Coast, Sierra Nevada and Cascades, and Marine regions.

Major Wildlife Stressors Identified by Region

Mojave Desert

- Multiple uses conflicting with wildlife on public lands
- Growth and development
- Groundwater overdrafting and loss of riparian habitat
- Inappropriate off-road vehicle use
- Excessive livestock grazing
- Excessive burro and horse grazing
- Invasive plants
- Military land management conflicts
- Mining operations

Colorado Desert

- Water management conflicts and water transfer impacts
- Inappropriate off-road vehicle use
- Loss and degradation of dune habitats
 - Disruption of sand transport processes
 - Invasive plant species
 - Inappropriate off-road vehicle use
- Growth and development
- Invasive species

South Coast

- Growth and development
- Water management conflicts and degradation of aquatic ecosystems
- Invasive species
- Altered fire regimes
- Recreational pressures

Central Coast

- Growth and development
- Intensive agriculture
- Excessive livestock grazing
- Water management conflicts and degradation of aquatic ecosystems
- Recreational pressures
- Invasive species

North Coast–Klamath

- Water management conflicts
- Instream gravel mining
- Forest management conflicts
- Altered fire regimes
- Agriculture and urban development
- Excessive livestock grazing
- Invasive species

Modoc Plateau

- Excessive livestock grazing
- Excessive feral horse grazing
- Altered fire regimes
- Western juniper expansion
- Invasive plants
- Forest management conflicts
- Water management conflicts and degradation of aquatic ecosystems

Sierra Nevada and Cascades

Stressors affecting upland habitats

- Growth and land development
- Forest management conflicts
- Altered fire regimes
- Excessive livestock grazing
- Invasive plants
- Recreational pressures
- Climate change

Stressors affecting aquatic and riparian habitats

- Water diversions and dams
- Watershed fragmentation and fish barriers
- Hydropower project operations
- Excessive livestock grazing
- Water diversion from the Owens Valley
- Introduced non-native fish

Central Valley and Bay-Delta

- Growth and development (including urban, residential, and agricultural)
- Water management conflicts and reduced water for wildlife
- Water pollution
- Invasive species
- Climate change

Marine Region

- Overfishing
- Degradation of marine habitat
- Invasive species
- Pollution
- Human disturbance